UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND
TOXIC SUBSTANCES

Memorandum

Date: August 29, 2001

SUBJECT: Pecans Initial Benefits Assessment for Azinphos-methyl and Phosmet

FROM: Karen Angulo, Team Leader and Biologist
Antimicrobials and Plant Pathogens Branch

David Donaldson, Economist
Economic Analysis Branch
Biological and Economic Analysis Division (7503C)

THROUGH: David Brassard, Senior Scientist
Jonathan Becker, Acting Chief
Herbicide and Insecticide Branch

Arthur Grube, Senior Scientist
David Widawsky, Team Leader and Acting Chief
Economic Analysis Branch

TO: Diane Isbell, Chemical Review Manager
Veronique LaCapra, Chemical Review Manager
Margaret Rice, Chief
Reregistration Branch 2
Special Review and Reregistration Division (7508C)

CC: Denise Keehner, Director, OPP/BEAD

SUMMARY

Based on available published data and personal communications with crop experts, BEAD believes that extending the restricted entry intervals for phosmet and azinphos-methyl will result in limited impacts for pecans. Adequate alternatives appear to be both available and are currently efficacious (although pest resistance could develop in the future). BEAD believes that the most likely outcome resulting from extending the restricted entry interval is that growers will switch to alternative chemical control measures, which are already in use. Based on communications with crop experts 1) no losses of quality or yield are expected to result if the use of phosmet on pecans were canceled, and 2) azinphos-methyl is no longer used on pecans in Texas, Louisiana, or Georgia, and has not been used for many years (greater than 5 years) mainly because of toxicity concerns and the availability of acceptable alternative pest control methods.

BACKGROUND

The following general production information was compiled from the USDA Crop Profiles publically available on the Internet for pecans in Texas and North Carolina, and from conversations with pecan growers and crop consultants who provided information for this report.

Pecans are long-lived trees that produce nuts for many years. In Texas, pecans are found in irregularly-shaped native stands ("groves") that established over time through natural seed. Human planted stands of improved varieties ("orchards") are planted to 35 trees per acre and then progressively thinned over 40 - 80 years to 4 to 8 trees per acre. Improved pecan varieties provide more than half of the total nut production. A 50% open foliar canopy is desired for light penetration and yields. Pest control is better when optimum tree densities are maintained and pesticides can be applied to tree foliage.

In Texas, land in native production is not suitable for rotation with annual row crops because of the close proximity to rivers and streams that flood, but forage plants on native pecan lands are commonly grazed by livestock. In improved orchards, inter-row areas may be planted with crops grown for annual production, such as cotton, before tree roots expand or foliage creates a shade canopy.

In Texas, native pecans are not irrigated because of the irregular spacing of trees and the fact that roots grow deep to reach moisture in alluvial profile. Most orchard plantings are drip or mist-irrigated, with increasing amounts of water as trees continue to grow into production. Drip irrigation is practiced to reduce water requirements, increase use efficiency, and minimize weed growth. Chemigation is not common because few pests are controlled by soil-applied pesticides. In North Carolina, pecans are grown in lighter soils in the Coastal Plain, therefore, irrigation is more commonly practiced.

Mechanical harvesting appears to be the predominant harvesting technique around the United States. Tractor-mounted hydraulic shakers dislodge nuts from the trees, and soon thereafter the fallen nuts are commonly wind-rowed and swept up from the ground. Catch frames are used in some orchards to catch the nuts before they reach the ground. Mowing is necessary close to harvest to provide a weed-free orchard floor for sweeping.

Production Data for Pecans:

U.S. Pecan Production

Total U.S. pecan production averaged 274 million pounds from 1997 to 1999, and was valued at $257.6 million. The top six production States (in terms of pounds of production), which account for 83% of total U.S. production, are Georgia (77 million pounds), Texas (68 million pounds), Oklahoma (27 million pounds), New Mexico (26 million pounds), Louisiana (15 million pounds) and Arizona (14 million pounds) (Table 1).

Table 1. Pecans: 1999 Area, Production, and Value of Production in the U.S. by State.

U.S./State	Harvested Acreage (Acres)	Production (million pounds)	Percent of US Production	Value of Production ($1000)
Arizona	14,502	14	5%	$18,859
Georgia	131,873	77	28%	$74,060
Louisiana	15,091	15	6%	$9,328
New Mexico	29,622	26	9%	$29,346

U.S./State	Harvested Acreage (Acres)	Production (million pounds)	Percent of US Production	Value of Production ($1000)
Oklahoma	83,837	27	10%	$16,846
Texas	167,844	68	25%	$60,361
Other States[1]	53,121	47	17%	$46,987
Total United States	519,954	274	100%	$257,630

Source: Harvested acreage is from the 1997 Census of Agriculture. All other data is from the U.S. Department of Agriculture, National Agricultural Statistics Services's Agricultural Statistics 2000.
Note: Except for harvested acreage, data is a three year average for 1997 to 1999.
1. Other States include AK, CA, FL, IA, IL, IN, KS, KY, MD, MS, MO, NE, NV, NC, OH, SC, TN, UT, and VA.

USE OF AZINPHOS-METHYL AND PHOSMET IN PECANS

Texas and Georgia were selected for this assessment because they are major pecan producers in their geographic regions. Louisiana was selected because of the historically high use of azinphos-methyl and phosmet that was reported by EPA proprietary sources of pesticide usage data. The following section summarizes for each of these states the use of azinphos-methyl and phosmet, the target pests, and alternative pest control methods.

Azinphos-Methyl: Azinphos-methyl is no longer used on pecans in Texas, Louisiana, or Georgia, and has not been used for more than 5 years mainly because of toxicity concerns to applicators and non-target organisms (including cattle grazing in the orchards), and the availability of acceptable alternative pest control methods. In the past, azinphos-methyl was typically used to control pecan weevil, which can be damaging late in the season. Infestations are often localized within orchards, and pecan weevil emergence and populations are monitored with one of several different types of pheromone traps. Carbaryl is now used predominately to control pecan weevil. Azinphos-methyl was also used to control pecan nut casebearer, but other less toxic materials are now used. In addition, some pecan growers run cattle in their orchards, and there have been poisoning incidents related to azinphos-methyl reported. The lengthy proposed restricted entry intervals for azinphos-methyl would eliminate its use (that is, if anyone was interested in using it). No loss of quality or yield would result in the cancellation of azinphos-methyl on pecans. This conclusion is based on personal communications with crop experts and pecan growers and is supported by data published in the USDA/NASS 1999 agricultural Chemical Usage Fruit and Nut Summary. The only State showing azinphos-methyl usage in the NASS survey was Texas. Actual numbers (percent of crop treated, etc.) were not published by NASS to avoid disclosure, but it is believed that this use is minor. In light of this conclusion, azinphos-methyl will not be mentioned further in this assessment.

Phosmet:

Major Pests Controlled by Phosmet.

Pecan Nut Casebearer is the most common and economically damaging insect to pecans in Texas and Louisiana, and can cause serious losses from larvae feeding inside the nuts. Adults can complete several generations in a year, and even with IPM, more than half of the pecan acreage is treated with insecticides. It is important to apply the pesticide before the pecan nut casebearer larvae can enter the nuts. Once inside, pesticides are ineffective at controlling casebearer. Adult emergence is monitored by pheromone traps and spraying is initiated when egg laying reaches a certain level as determined through monitoring. Biological control from parasitic wasps and other natural enemies help suppress larvae. Pecan nut casebearer is a less important pest in Georgia.

Hickory Shuckworm is a mid- and late-season pest that tunnels into the shucks that surround the developing nut, and this causes a number of problems that result in reductions in yield. Pheromone traps monitor emergence and capture many adults. As with pecan nut casebearer, it is important to apply the pesticide before hickory shuckworm larvae can enter the shucks. Once inside, pesticides are ineffective at controlling hickory shuckworm. Again as with pecan nut casebearer, biological control from parasitic wasps and other natural enemies help suppress larvae of the hickory shuckworm.

Black Pecan Aphids are a significant pest in Georgia, causing serve leaf damage and defoliation. This aphid and the yellow aphid are pests in Texas and Louisiana, but outbreaks are often the result of a reduction in natural enemies. Black pecan aphid outbreaks can be very severe and can cause economic loss. Infestations are often greatest in the fall. Natural enemies are important in maintaining low numbers of black pecan aphid, but populations can explode when natural enemies are reduced by the use of broad-spectrum insecticides. Aphids can be difficult to control because of pesticide resistance and uneven control by many pesticide products.

Integrated Pest Management (IPM) in Pecans.

While insecticides are still used to manage insect pest populations within economic thresholds, pecan growers successfully use a variety of IPM techniques to manage the insect pests that attack pecans. Personal communication with crop experts in Texas, Georgia, and Louisiana revealed that the large majority of the commercial crop is regularly scouted, and environmental conditions are monitored for insect emergence. Physical and pheromone traps are often used to monitor populations of major pests. Beneficial insect populations are encouraged. The crop experts stated that there are few pesticides available for the control of the major pests in pecans and all expressed a strong interest in keeping all of the pesticides they currently have because of pest resistance management issues. Pecan growers have established a general rotation plan that starts with broad-spectrum pesticides early in the season (timed to catch the emergence of several major pests), and then rotates between pesticides of varying types and toxicities over the remainder of the year. They justify the continued use of phosmet because they claim it has fewer negative impacts on beneficial insects than other broad-spectrum alternatives.

Table 3. 1999 Usage of Phosmet on Pecans by Major State.

U.S./State	Percent of Crop Treated	Base Acres Treated [1]	Total Pounds Applied	Average Number of Applications (#/year)	Average Application Rate (lbs/acre)
United States [2]	5%	26,000	26,800	1.0	1.03
Arizona	0%	0	0	0	0
Georgia	8%	10,550	13,187	1.0	1.25
Louisiana [3]	20%	3,000	9,000	1.0	3.00
New Mexico	-	-	-	-	-
Oklahoma	-	-	-	-	-
Texas	NP	NP	NP	NP	NP
Other States [4]	-	-	-	-	-

Source: USDA/NASS Agricultural Chemical Usage, 1999 Fruit and Nut Summary, July 2000, unless otherwise indicated.
'NP' indicates that usage was observed and that data were collected by NASS but were not published.
A dash (-) indicates that public data was either not available or not applicable.

1. Base acres treated is calculated using percent of crop treated estimates and bearing acreage from Table 1.
2. The U.S. EPA Quantitative Usage Analysis (QUA), 6/99, estimates an average of 3% of the total pecan crop treated with 30,000 pounds of phosmet applied in the U.S. Based on ten years of data and multiple data sources.
3. Percent of base acres treated, application rate per acre, and number of applications per year are from the National Center for Food and Agricultural Policy (NCFAP), 1997 estimates. Base acres treated and total pounds of active ingredient are calculated using these estimates and acres harvested from Table 1.
4. USDA/NASS reports no usage of phosmet in CA, NC, and SC, but did indicate some usage (not published) in FL.

Use of Phosmet in Texas.

Target Pests: One application of phosmet is timed to control pecan nut casebearer and hickory shuckworm in late April in the southern part of Texas, and in late May in the northern part of the state. Pesticide applications for these pests may continue about 10 days apart until June. Later in the year (July - August), an additional application of phosmet may be used to control hickory shuckworm.

Alternative Pest Control Methods: In April and May, a rotation of pesticides other than phosmet is used about 10 days apart until June, including the insect growth regulator tebufenozide (Confirm) for hickory shuckworm and chlorpyrifos (Lorsban) for pecan nut casebearer. Pyrethroids may be used, but are not preferred because of their impact on beneficial insects and resultant flare of mites.

Use of Phosmet in Louisiana.

Target Pests: Phosmet is used by some pecan growers 1 or 2 times in June through mid-July to control pecan nut casebearer and hickory shuckworm. It doesn't appear that phosmet is used later in the year in Louisiana. Some growers do not use phosmet at all.

Alternative Pest Control Methods: Growers rotate to chlorpyrifos and tebufenozide for similar reasons as stated for Texas, above. Imidacloprid (Provado), *Bacillius thuringiensis* (Bt), and pryrethroids are additional alternatives. Tebufenozide is preferred over chlorpyrifos, but it is nearly twice the cost. Pheromone traps are used to monitor pecan nut casebearer and hickory shuckworm.

Use of Phosmet in Georgia.

Target Pests: Phosmet is used by some growers in July and August for control of black pecan aphid, which is a significant pest in Georgia pecans. Pecan nut casebearer and hickory shuckworm are not as important in Georgia as they are elsewhere. Nevertheless, one application of phosmet is applied by some growers in mid-May for pecan nut casebearer, and one to two applications are typically applied in August to control hickory shuckworm. Other growers have not used phosmet in some time because of the negative impact on beneficial insects.

Alternative Pest Control Methods: Chlorpyrifos is one alternative that is used to control pecan nut casebearer and hickory shuckworm, but it is recognized that it (like other broad-spectrum pesticides) affects beneficial insect populations. Serious outbreaks of black pecan aphids and the difficult-to-control yellow aphids have occurred when populations of natural enemies have declined. Besides chlorpyrifos, imidacloprid and dimethoate are alternatives to phosmet. While imidicloprid is used to control aphids, it is used at high rates and is expensive.

RESTRICTED ENTRY INTERVALS

Phosmet - The current restricted entry interval for phosmet on pecans is 24 hours. Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical. The

phosmet registrant has proposed extending the restricted entry interval to 27 days. The current pre-harvest interval for pecans is 14 days.

IMPACTS RELATED TO OCCUPATIONAL MITIGATION

Phosmet - Under the worst case scenario, BEAD believes that pecan growers will replace the use of phosmet with one of several available efficacious alternatives, which are already used more often than phosmet. (See the above sections covering the alternative chemical controls to phosmet.)

The worst case scenario is based on the proposed restricted entry interval for phosmet of 27 days. The restriction would most affect scouting, because this is a frequent activity that is key to successful pecan IPM. Weekly scouting occurs in the April - June time frame when the major pests are emerging, and the early use of phosmet with a 27-day restricted entry interval would severely limit scouting during this critical time. Irrigation (drip or overhead sprinkler) activities would be similarly affected in those areas that depend on irrigation.

Pruning activities, on the other hand, are irregular and would not often be impacted by the proposed restricted entry interval. The large majority of pecans are mechanically harvested, and mowing is critical for harvesting. Nevertheless, harvesting activities would not be affected by the proposed restricted entry interval because the last applications of phosmet are applied 1 to 2 months before harvest. Phosmet is not applied after this period because the mature pecan nut is not susceptible to the pests phosmet is used to control. In Texas, pecans are typically harvested from September to October, and the last time phosmet is used is in August. In Louisiana, pecans are typically harvested from October to November, and phosmet is not used after mid-July. In Georgia, harvest typically occurs from October to November, and the last time phosmet is used is typically in August.

BEAD does not expect to see any grower, regional, or national level impacts from extending the restricted entry intervals for phosmet on pecans, because BEAD believes growers will obtain the same level of control with the alternatives as they currently do with phosmet. All crop experts that were consulted indicated that this would be the case.

There are several effective chemical, biological, and cultural pest control alternatives for the key insect pests in this crop. The use of alternative chemical controls could, however, cost more than phosmet ($7.59 per treated acre). Other organophosphate insecticides such as chlorpyrifos and cypermethrin are comparable in cost to phosmet at $10.16 and $5.82, respectively. Newer pesticides such as tebufenozide ($14.41 per treated acre) and imidacloprid ($11.16 per treated acre) are slightly more expensive than phosmet, but still, these alternative insecticides are already used on pecans – even the more expensive pesticides. In fact, for most of the alternatives, more pecan acreage is treated with an alternative to phosmet than with phosmet itself. According to the National Agricultural Statistics Service of the U.S. Department of Agriculture, 5% of the pecan acreage is treated with phosmet. This is in contrast to chlorpyrifos at 38%,cypermethrin at 8%, tebufenozide at 7%, and imidacloprid at 14%.

CHARACTERIZATION OF IMPACTS ON CROP

Based on the availability of numerous similarly priced alternatives, BEAD believes that extending the restricted entry intervals for phosmet would have no significant impact on pecan growers.

LITERATURE CITED

USDA Crop Profiles for Pecans in Texas, May, 2000. Website address:
http://pestdata.ncsu.edu/cropprofiles/docs/txpecans.html

USDA Crop Profiles for Pecans in North Carolina, December 1999. Website address:
http://pestdata.ncsu.edu/cropprofiles/docs/ncpecans.html

Managing Insect and Mite Pests of Commercial Pecans in Texas, March 1998. Texas Agricultural Extension Service, Texas A&M University System.

1997 Texas Pecan Book. January 1997. Texas Agricultural Extension Service, Texas A&M University System.